Remarks

Claims 1-31 were pending in the application. Claims 1-31 were rejected in the Office Action. By the above amendments, the applicants have amended claims 1, 7, 18, 21-28, 30, and 31. Accordingly, claims 1-31 are pending.

INFORMATION DISCLOSURE STATEMENTS

The Office Action includes a copy of the IDS filed by applicants in Aug. 2007 with the Examiner's initials indicating that the references submitted by the IDS were considered by the Examiner. The applicants note that the IDS misidentified one reference. The reference is: YIN ET AL., "Formation of Hollow Nanoparticles..." Science, Vol. 204, p 711... which includes a typographical error in that, "Vol. 204," should be, "Vol. 304," as indicated on the copy of YIN ET AL. that was submitted along with the IDS.

A new IDS is being filed along with this response that submits four references.

CLAIM AMENDMENTS

Claim 1 was amended to identify that the nanoparticle is "not a metal-chalcogenide semiconductor." A metal-chalcogenide is a binary compound of a metal and a chalcogen, the latter of which is an element selected from the group of oxygen, sulfur, selenium, and tellurium. A metal-chalcogenide semiconductor is a metal-chalcogenide that is a semiconductor (i.e. it has a bandgap between a valence band and a conduction band). While the applicants teach that a shell that surrounds the nanoparticle may be a metal-chalcogenide (e.g., CoO or CoSe at p. 7, lines 16-19, and p. 9, lines 21-23), none of the embodiments or examples taught by the applicants recite a nanoparticle within the shell that is a metal-chalcogenide semiconductor.

Claim 7 was amended to delete "either" and "branched." Claim 18 was amended to correct an antecedent basis error.

Claim 21 was amended to clarify that a portion of the "first material" that coats the "nanoparticle" is removed to form "a space within which the nanoparticle is disposed." Support for this amendment may be found at, for example, p. 8, line 5-p.9, line 1.

Claims 22-27 were amended to correct antecedent basis errors. Claim 28 was amended to correct a typographical error.

Claims 30 and 31 are method claims that had previously incorporated the subject matter of claim 1 by dependency. In order to separate these method claims from claim 1, the dependency to claim 1 was deleted and all of the limitations of claim 1 were added to claims 30 and 31. Further, a "producing" step was added to each of these claims to clarify that these claims produce results.

These claim amendments add no new matter to the application.

CLAIM REJECTIONS UNDER 35 USC 112

Claims 7 and 18 were rejected under 35 USC 112 as being indefinite. By the above amendments, the applicants have amended claims 7 and 18 so that they are definite. Other claims that were rejected as being indefinite were rejected because of their dependence upon claim 7 or 18.

CLAIM REJECTIONS UNDER 35 USC 102

Claims 1-4 and 7-30 were rejected under 35 USC 102 as being anticipated by U.S. Pat. No. 7,381,465 to Torimoto et al., which is respectfully traversed.

Claim 1 was rejected as anticipated by Torimoto et al. Torimoto et al. does not anticipate claim 1 as amended, which is explained as follows. Torimoto et al. teach a core-shell structure in which the core is a nanoparticle which resides in a void within the shell. This is taught by Torimoto et al. at col. 2, lines 54-62, which reads:

> The core 2 may be anything so long as a solid having a photoabsorption edge, and preferably a metal chalcogenide semiconductor, for example, CdS (cadmium sulfide). The core diameter is controlled to the predetermined value from several tens of nm to 1 nm. The shell 4 may be anything so long as a non-photoetchable material, and, for example, SiOx (silica, 0<x). The diameters of the shell 4 and the shell hole 6 are controlled to the desired values from several tens of nm to 1 nm depending on the field of application. The void space inside the shell 3 is controlled to the predetermined value from several tens of nm to 1 nm.
>
> The core-shell structure having the adjustable void space inside the shell of the present invention can be used, for example, in the field of application as shown below.

> The core-shell structure having the adjustable void space inside the shell 1 has a micropore in the shell 4, and selectively passes specific metal ions.

While it may be argued that according to this passage "the core ... may be anything," such an argument lacks merit because, if the core is the "non-photoetchable material" of the shell, the core would not exist. Thus, the core taught by Torimoto et al. must be a photoetchable material. Moreover, the "photoabsorption edge" that the nanoparticle must have according to the above cited passage inherently requires that the nanoparticle be a photoetchable material since the photoabsorption edge is a property that relates to the photoetchability of such a material, which is taught by Torimoto et al. at col. 8, line 54-col. 9, line 10. (The applicants note for clarity that in the passage that begins at col. 8, line54, the "photoabsorption edge" is referred to as an "absorption edge.") The nature of this photoetchable material is made clear by Torimoto et al. at col. 9, lines 11-21, which reads:

> Here, the control method of a void space inside a shell of the present invention utilizes the size-selective photoetching method that was proposed by the present inventors (See References: J. Electrochem. Soc., 145, 1964-1968 (1998), Chem. Lett., 379-380 (1999), and J. Phys. Chem. B, 105, 6838-6845 (2001)). This size-selective photoetching method is such that utilizes the phenomena that the energy gap of a semiconductor nanoparticle increases by the quantum size effect as the particle diameter decreases, and that a metal chalcogenide semiconductor is oxidatively corroded by photo irradiation in the presence of dissolved oxygen.

This passage makes clear that it is the photoetchability of metal-chalcogenides that produces the void in the core-shell structure taught by Torimoto et al. Further, the applicants note that three of the four references provided by the IDS that is being filed along with this response are the three papers cited in the above quoted passage from Torimoto et al. A review of Torimoto et al. and the three papers cited by Torimoto et al. reveal no material but CdS and possibly ZnS that produce the nanoparticle taught by Torimoto et al. The possibility of ZnS is indicated in their paper, Torimoto et al., *J. Phys. Chem. B.* 105 (2001) 6838-6845, which is included in the IDS submitted along with this response. This paper references earlier work of theirs where they say that they reported size-selelctive photoetching of ZnS. CdS and ZnS are two metal-sulfide semiconductor species within the much larger genus of metal-chalcogenide semiconductors. Moreover, despite Torimoto et al. teaching that their nanoparticle can be a photoetchable solid that

"comprises a metal, a metal oxide, a semiconductor, or a polymer," at col. 2, lines 65-68, their disclosure as a whole is most certainly limited to metal-chalcogenide semiconductors and possibly limited to the particular metal-chalcogenide of CdS as discussed in the passage from Torimoto et al. provided directly above.

Claim 1 as amended includes the limitation that the "nanoparticle is not a metal-chalcogenide semiconductor," which is not anticipated by Torimoto et al. because the nanoparticle taught by Torimoto et al. must be a metal-chalcogenide semiconductor as explained above. Thus, claim 1 is not anticipated by Torimoto et al. and, accordingly, claim 1 is allowable.

Claims 2-4, 7-20, 28 and 29 depend from the allowable claim 1 and for at least this reason are not anticipated by Torimoto et al. and, accordingly, these claims are allowable

Claim 21 was rejected as anticipated by Torimoto et al. Torimoto et al. does not anticipate claim 21 as amended, which is explained as follows. Torimoto et al. teach forming a core-shell structure having a void space inside the shell by coating a coating a photoetchable particle to form the shell and by photoetching the photoetchable particle to produce the void space. This is taught by Torimoto et al. at col. 3, lines 27-45, which reads:

> [T]he method of preparation of a core-shell structure having an adjustable void space inside a shell in accordance with the present invention is characterized in that: *a particle comprising a photoetchable solid* is prepared while its particle diameter is controlled; a particle surface is chemically modified with a chemical material containing a component element capable of bonding to said particle surface and a group containing a component element of non-photoetchable oxide, thereby said group is introduced into said particle surface; a coating film made of said oxide is formed by hydrolyzing said group containing a component element of non-photoetchable oxide; a core-shell structure is formed with said particle as a core, and said coating film as a shell; *said core-shell structure is photo-irradiated in a photoetching solution of controlled wavelength; and an adjustable void space is formed inside the core-shell structure.* According to this method, a core-shell structure having an adjustable void space inside a shell can be prepared.

The italics in the above passage have been added here. As can be seen from this passage, Torimoto et al. teach that the particle that is the precursor of the nanoparticle is made of a "photoetchable solid" and the size of this photoetchable solid is reduced by

"photo-irradiat[ing] it in a photo-etching solution." Thus, as taught by Torimoto et al., the precursor of the nanoparticle has its size reduced to form the nanoparticle within the shell. In contrast, claim 21 claims coating "a nanoparticle" with a "first material" and "reacting the first material with a second material" to "form a space within which the nanoparticle is disposed." Thus, it can be seen that claim 21 produces a nanoparticle within a shell by starting with the nanoparticle and forming a shell and a void around the nanoparticle, which is different from the method taught by Torimoto et al. that starts with a precursor of the nanoparticle and reduces its size to form the nanoparticle.

Thus, claim 21 is not anticipated by Torimoto et al. and, accordingly, claim 21 is allowable.

Claims 22-27 depend from the allowable claim 21 and for at least this reason are not anticipated by Torimoto et al. and, accordingly, these claims are allowable

Claim 30 was rejected as anticipated by Torimoto et al. Claim 30 is a method claim that includes all of the limitations of claim 1 as amended by the above amendments. As discussed above, claim 1 is not anticipated by Torimoto et al. According, claim 30 is not anticipated by Torimoto et al. and, accordingly, this claim is allowable.

CLAIM REJECTIONS UNDER 35 USC 103

Claims 5, 6, 29, and 31 were rejected under 35 USC 103(a) as being obvious over U.S. Pat. No. 7,381,465 to Torimoto et al., which is respectfully traversed.

Claims 5, 6, and 29 were rejected under 35 USC 103(a) as being obvious over Torimoto et al. Claims 5, 6, and 29 are dependent claims that depend from claim 1. The difference between claim 1 and Torimoto et al. that is discussed above relative to the anticipation rejection of claim 1 has not been addressed in the obviousness rejection. In particular, claim 1 as amended includes the limitation that "the nanoparticle is not a metal-chalcogenide semiconductor." Thus, the rejection fails to establish that claims 5, 6, and 29 would have been obvious to one skilled in the art and, accordingly, these claims are allowable.

Claim 31 was rejected under 35 USC 103(a) as being obvious over Torimoto et al. Claims 31 is a method claim that includes all of the limitations of claim 1. The difference between claim 1 and Torimoto et al. that is discussed above relative to the anticipation

rejection of claim 1 has not been addressed in the obviousness rejection. In particular, claim 1 as amended includes the limitation that "the nanoparticle is not a metal-chalcogenide." Thus, the rejection fails to establish that claim 31 would have been obvious to one skilled in the art and, accordingly, this claim is allowable.

CONCLUSION

Applicants believe that the application is now ready for allowance and an allowance at an early date would be appreciated. If the Examiner believes that a telephone interview would help resolve any remaining issue, the Examiner is encouraged to call the undersigned at 510-486-6503. If any additional fee is required to maintain pendency of this application, the Commissioner is authorized to charge such fees to Deposit Account No. 120690.

Respectfully submitted,

Dated Feb. 25, 2009

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